

shaped golden spot is present on the back of most individuals even when young. Eyes are black and dilatable; the pupil is round and reflects red against light at night. Overall colour pattern resembles the commoner cricket/paddy field frog *Rana limnocharis*. However *keralensis* is stockier, with the hump on the back more pronounced at rest. Larger eyes protruding more abruptly above the head, shorter snout and the absence of balloon-like vocal sacs when calling are further pointers that distinguish the species from *limnocharis* in the field.

The species is largely nocturnal. Adults that I have seen and collected were mostly resting during the day and foraging at night. They tend to hide, unlike the juveniles which are more often encountered during the daytime. In captivity, both adults and juveniles feed during the day. This frog is not very timid and if disturbed takes only short leaps. Wherever there is water individuals dive in, in an attempt to escape. However they surface soon (if not immediately) some distance away.

**Voice and calls:** I have not heard this species in the wild. However, males in captivity were very vocal both during the night and day in June and all through the rainy season. Males start calling as soon as it is cloudy and after a sudden shower of rain. The typical call is a series of 9-11 rather aggressive croaks: *crok crok crok...crok*. Males also produce a series of softer *chucks* when combatting a rival male. Juvenile frogs (20-24 mm snout-vent) often called during the afternoons. The calls were very soft and insect-like: *check check chekka chekka chekka...chek*. The significance of this call is not clear though it often coincided with cloudiness.

**Food and feeding:** Both adults and juveniles feed readily in captivity. Juveniles eat small grasshoppers and moths, termites (wingless) and caterpillars. Adults consume grasshoppers, moths and winged termites. Earthworms are readily accepted. An adult female once even ate a castor moth *Pericallia ricini*. Cockroaches

*Periplaneta americana* are taken in all sizes. A female frog 55 mm snout-vent can swallow adult cockroaches.

All insects are picked up from the surface though occasionally some are caught flying. The frogs are not good at foraging in deeper water where they have to swim or float. When larger insects have to be tackled, the forelegs are used. While dealing with large moths the forelegs are used to break off the wings before the body is swallowed.

**Geographical range:** The range of *Rana keralensis* has been given as the Western Ghats of Kerala and Tamil Nadu (Daniel 1975, Inger *et al.* 1984, Inger and Dutta 1986). I found that this species extends much further north along the Western Ghats. While its southern limit of distribution lies in the hills of the Kanyakumari district where this species is very common (June), its northern limit is Maharashtra. I failed to find this species in Silent Valley (December) and Peechi (February). However I found juveniles in Neria and Byndoor (Dakshina Kannada, September-November) in coastal Uttara Kannada (after the rains) and surprisingly an adult female in Rohaghat (south-western Maharashtra, October). The species has been reported to occur in Goa as well (Sekar 1991).

**Habitat and microhabitat:** Of all vertebrates, amphibians are probably more choosy about habitats and microhabitats due to their bimodal life-style and very sensitive skin. *Rana keralensis* has a preference for humid habitats. Streams flowing through evergreen or semi-evergreen forests seem to be the most preferred habitat of the species. Inger *et al.* (1984) collected the species at Ponnudi in evergreen, secondary and moist deciduous forests, forest clearings and rubber plantations. 50% of their collections were away from water. I have also come across this species in degraded forests, rubber and exotic plantations and paddy fields in forest clearings in various parts of the Western Ghats. However, I have always found this species close to a stream or a source of water. I

found the species away from water only during rainy nights. The study at Ponmudi was during May-June, the beginning of the rains. Hence Inger *et al.* (1984) collected a considerable proportion of their frogs away from water.

According to Inger *et al.* (1984) *R. keralensis* is terrestrial. They collected most of their specimens from leaf litter. Fewer individuals were found on rocks and bare soil. I found the species equally common in grass/leaf litter (when wet), bare wet soil along the edge of streams and on exposed rocks just above the surface of water. Juveniles sit beneath leaves with only their heads showing in shallow seepage pools across paths. Juvenile frogs in captivity prefer to sit between dead leaves in wet areas. Adults make cavities in wet soil at the edge of water, sitting exposed (though well camouflaged) or under cover of a piece of wood or rock.

Tadpoles have been collected from shallow muddy channels across roads and from potholes in rocks (Inger *et al.* 1984). I have not seen the tadpoles in the wild but have seen metamorphosing frogs in similar situations. Shallow channels in betelnut orchards are favourite breeding spots in Uttara Kannada (Karnataka). In captivity tadpoles were equally at home in deeper pools as well as a shallow channel with flowing water. However, development appeared to be faster in cooler water where the day temperature never exceeded 27°C as against the pool in which water temperature reached 30°C during the day.

Daniel (1975) has given the altitudinal range of this species as up to 2000 m. Inger *et al.* (1984) have, however, found this species mostly at altitudes of 100-300 m. This is probably more of a local phenomenon as the study of Inger *et al.* was limited to Ponmudi, a small part of Kerala. My observations over the Western Ghats suggest that this species is equally common at altitudes less than 100 m and between 450-600 m. I have not seen this species anywhere above 600 m. Despite evidences of its

occurrence at higher elevations, viz. 710 m (Inger *et al.* 1984) and that of Daniel (1975), it might be considered that this species prefers lower elevations, where it is certainly commoner.

**Breeding and development:** One male that I had collected in the hills of Kanyakumari district during June measured 35 mm snout-vent and was ready to breed. It was calling all through the night and early morning from within the box in which I had kept it. In August this male and two other males (40 and 37.5 mm snout-vent) were showing signs of breeding when a 55 mm female was introduced into their cage. There was a lot of aggression demonstrated by the males over the female. Males fought while calling agitatedly. Each tried to push the other out from what appeared to me a small, actively defended territory. A territorial male would leap from one position to another, driving out the other males and then on to the female, grabbing her from whichever end was within reach. The female, however, took no interest and always tried to kick the males off. Males persisted in clinging on to her and to the extent that she had to do all her feeding with a male on her back.

The female laid its first batch of eggs only in January after it was introduced into a large outdoor cage with flowing water, plants and litter on the ground. The eggs were like mustard seeds in clear jelly. 75% of the egg masses were in deep water (230 mm) and the rest in water less than 25 mm deep.

Number of eggs varied from 7 to 115 per mass. These were spread between two deep pools which are about 3 m apart and along the shallow channel connecting them. This suggests that the laying female was moving about. All laying took place during late night without any prior indication in the evening. Therefore the exact process and behaviour was not observed.

Table 1 gives the details of egg-laying. This species of frog seems to be able to breed under a wide range of temperatures (daily range 10-

TABLE 1  
EGG-LAYING IN *Rana keralensis* WITH DETAILS OF PERIODICITY, WEATHER CONDITIONS AND NUMBER OF EGGS LAID

Sr. No.	Date	Temperature (Range °C)	Relative Humidity %	Number of clusters	Deep/Shallow	Number of eggs per cluster	Total
1.	2.1.1991	—	—	—	—	—	200
2.	18.1.1991	17-27	32-52	9	4/5	12-47	235
3.	23.1.1991	15.5-28	19-52	4	2/2	37-81	269
4.	31.1.1991	13-28	35-52	9	7/2	12-56	260
5.	5.2.1991	15.5-30	13-40	4	4/0	15-115	260
6.	19.2.1991	16-31	11-15	5	5/0	14-35	133
7.	23.4.1991	20.5-34	20-52	7	7/0	7-55	203
8.	11.5.1991	—	—	4	4/0	10-21	56

\*Range during the daytime between 1000 and 1700 hrs

15°C) and fairly low relative humidity. Night temperature was as low as 13°C at least once and the relative humidity during the day was never more than 52%. A series of six broods were produced with an interval of 5–16 days. With one exception (133) the total number of eggs per brood was between 200 and 269. After over two months, another batch of eggs was laid. This was probably the beginning of a fresh series as after 18 days on 11 May 1991, the next batch of eggs was laid. Therefore, only the first six broods are discussed.

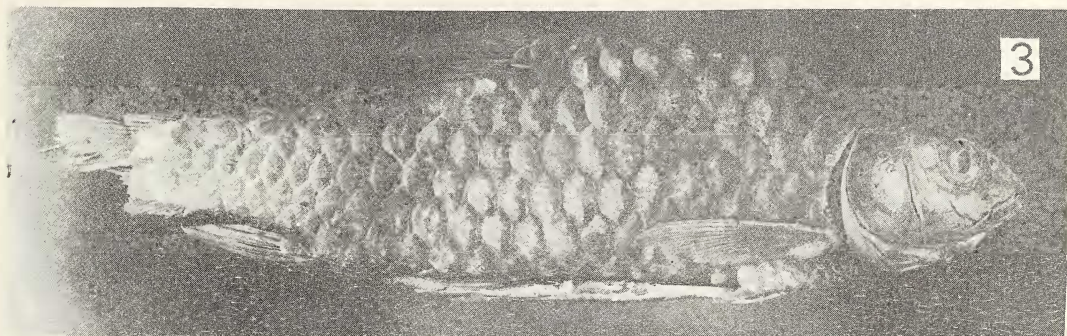
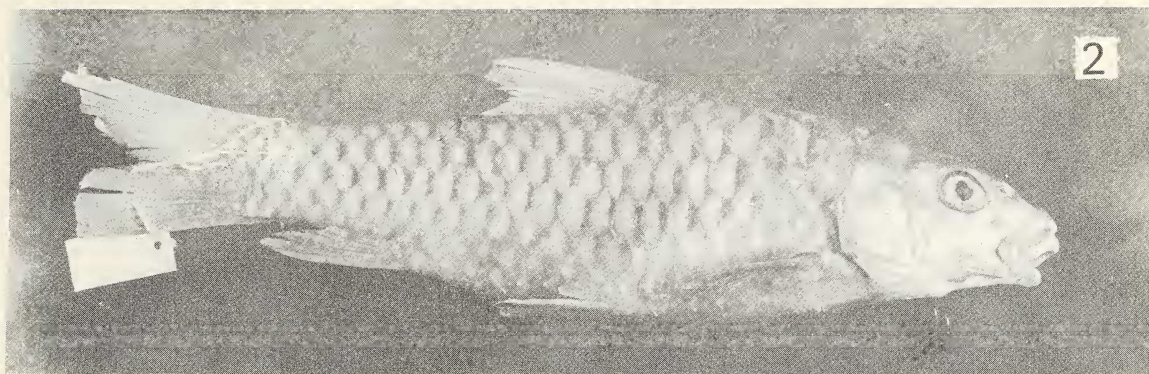
First hatching was 30 hours after laying. Hatching was delayed by 10–12 hours in another pool where the water temperature was 2.5–3.0°C warmer during the day. 57-90% of the eggs hatched. Tadpoles were brown, elongate (resembling mosquito pupae) and within the jelly. 48 hours after laying and 18 hours after the first hatching the tadpoles started swimming free.

Tadpoles are bottom feeders and under the microscope appear transparent, with the scattered brown pigments being darker on the back. Mallick and Mallick (1981) note that the tadpoles are initially herbivorous, taking slowly to animal food and to cannibalism. All these were observed in my study as well. Tadpoles gathered around a source of animal food such as a dead grasshopper and devoured it. Older tadpoles attacked and devoured the eggs that were in shallow water. Younger tadpoles were probably

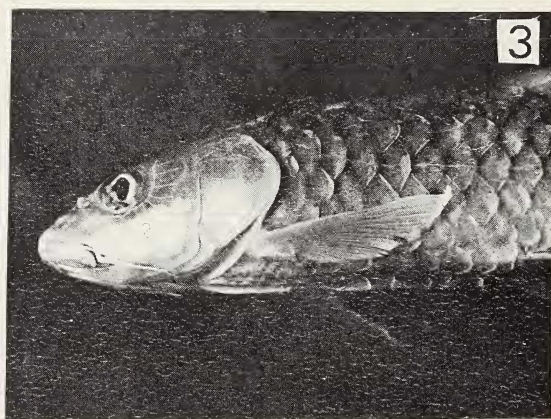
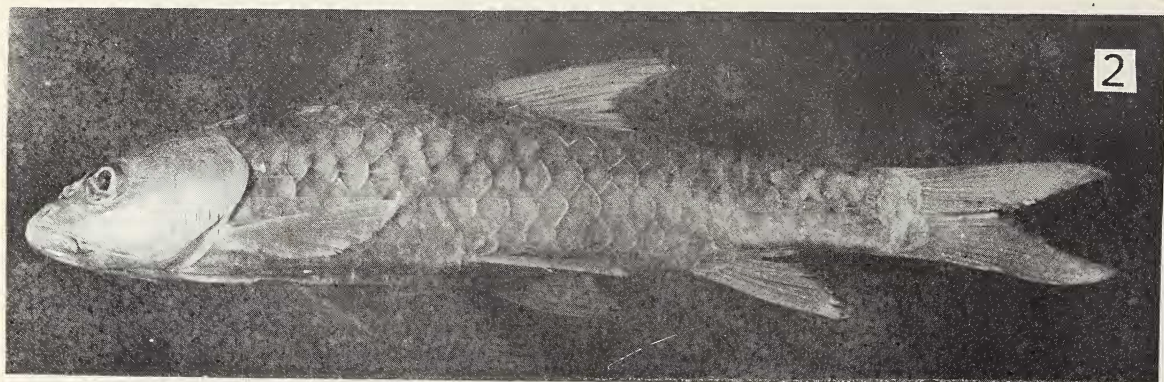
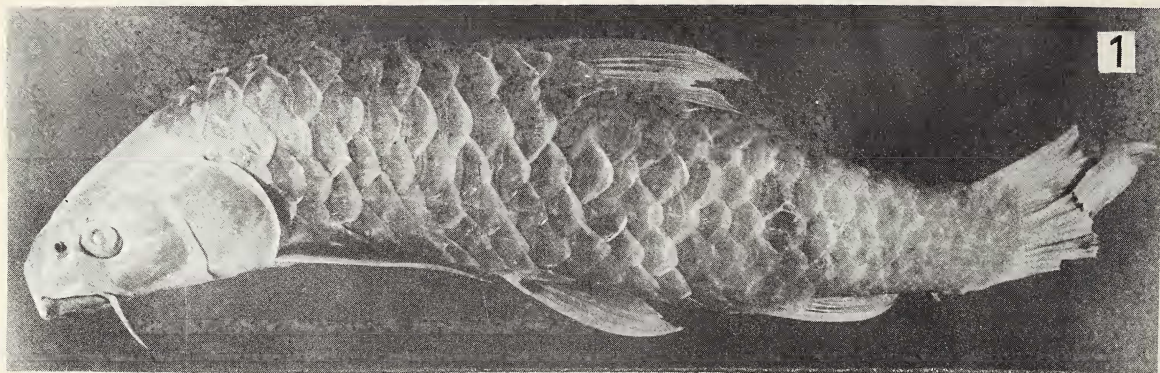
devoured too, as their numbers started coming down rapidly as the first batch of tadpoles were growing. Individuals were often found dead. There were also physical deformities like bent backs and tails in tadpoles.

The first batch of tadpoles showed hindlegs 45 days after hatching and 15 days later juvenile frogs appeared. There were, however, only 15 young frogs that developed despite the 200 eggs laid in the first batch. The number of frogs that developed from the subsequent batches could not be monitored as the different broods mixed together in the same pool and tadpoles were rapidly vanishing. Freshly metamorphosed frogs were less than 10 mm snout-vent and stayed close to the source of water from which they emerged after a period of three weeks. After this period the frogs dispersed over wet soil and litter. Frogs 60 days old measured 15 mm snout-vent.

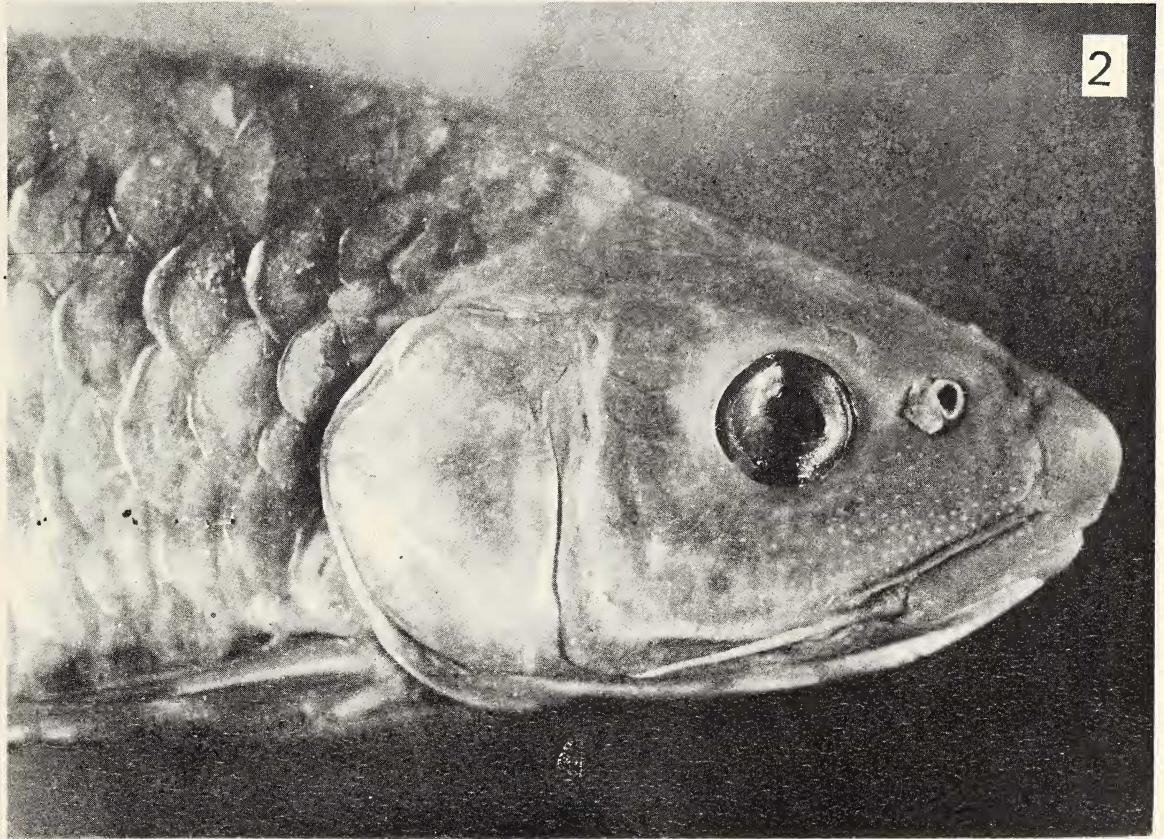
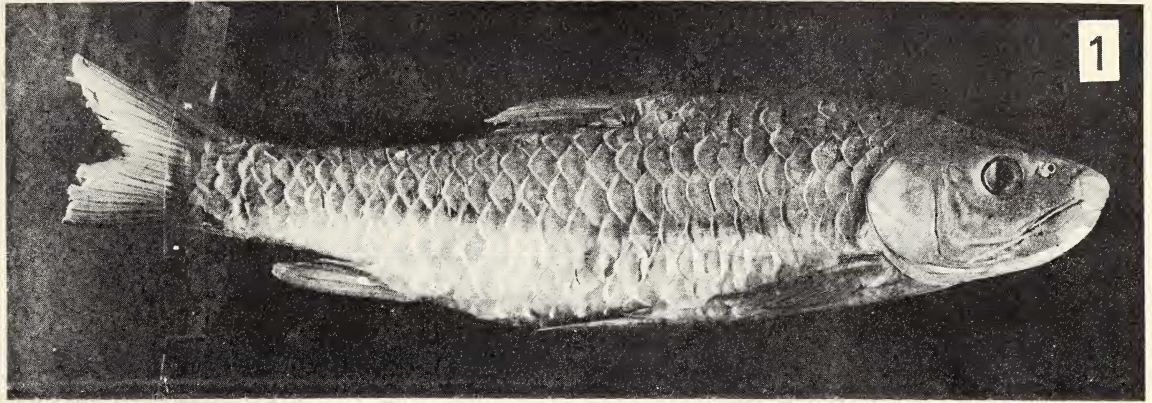
During various stages of development, eggs and tadpoles were subject to both cannibalism and to other predators. The number of tadpoles started declining rapidly after one of the pools was occupied by a large female *Rana hexadactyla*. An adult *Rana cyanophlyctis* moving between the pools could have also devoured some of the tadpoles. Metamorphosing frogs were devoured by a juvenile *Rana tigerina*. I have seen juvenile *tigerina* (15–25 mm) stay singly in pools where larval *keralensis* emerge as frogs. I have also witnessed a *tigerina*



Species of mahseer. 1. *Tor khudree* (Sykes) from Krishna river, Satara Dt., Maharashtra, 115 mm SL. 2. *Tor tor* (Ham.) from Suswa river, Dehra Dun, 126 mm SL. 3. *Tor kulkarnii* sp. nov. from Darna river, Deolali, Maharashtra, 200 mm SL.

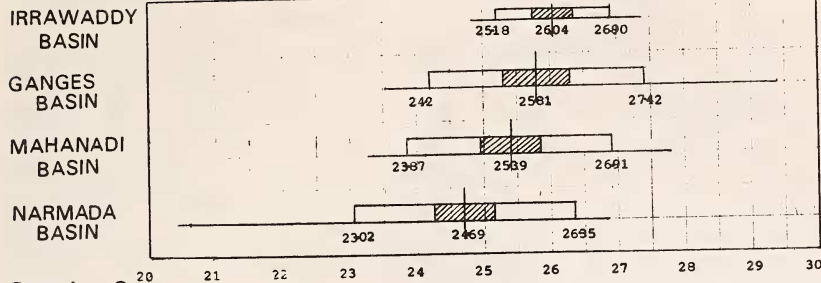


Species of mahseer: 1. *Tor putitora* (Ham.) from Assam, 300 mm SL. 2. *T. putitora* (Ham.) from Tawi river, Jammu; 180 mm SL. 3. Head of the above (from river Tawi) enlarged.

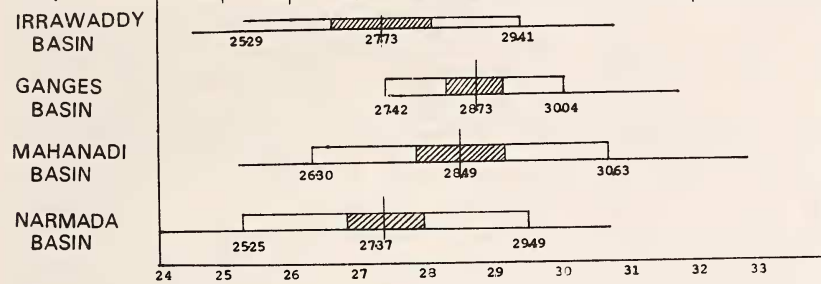


Species of mahseer: 1. *Tor progeneius* (McCell.) from Barak river, Karong, Assam, 270 mm SL.  
2. Head of the above,

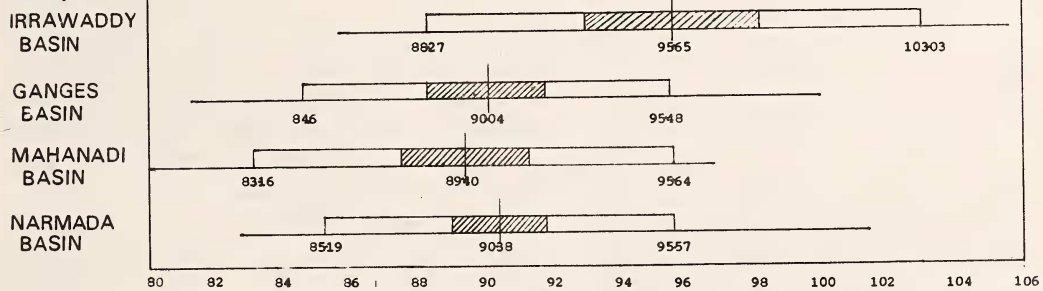
Graph 1



Graph 2



Graph 3



Graph 4

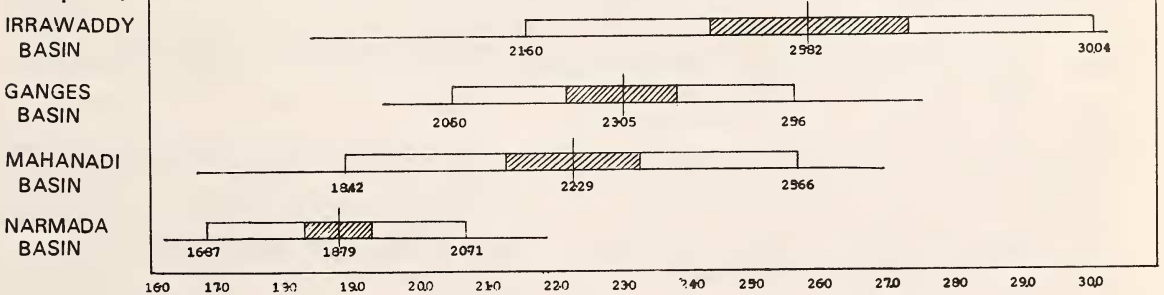


Fig. 1. *Tor tor* (Ham.)

Variation within samples from different drainages: Irrawaddy, Ganges, Mahanadi and Narmada.

Graph 1. Head length in SL, in per cent; Graph 2. Body depth in SL, in per cent; Graph 3. Head length in Body depth, in per cent; Graph 4. Eye diameter in Head length, in per cent.

of *Barbus (Tor) progeneius*, the large-scaled barbel described by McClelland from Assam. He observed that "in *tor* the head is more pointed and the body is considerably deeper and more pronounced along the ventral surface, while in *progeneius* the head is evenly pointed and is more or less equal to the depth of the body which is slender and graceful. *B. progeneius* in its general facies is similar to *B. mosal* and it is likely that when more material of the two forms becomes available they may prove to be identical." He further observed that in *B. progeneius* there is a rounded, fan-shaped structure behind the upper lip which in form and extent is quite different from the hypertrophied lip of *B. putitora* and *B. tor*. For this reason he considered *progeneius* as a distinct species. I have examined in the collections of the Z.S.I. several specimens of *Tor progeneius* from the Barak river, Assam, which has enabled me to establish its specific identity. The rounded fan-shaped structure that Hora noticed in one specimen has been proved to be an abnormal condition, as such a structure has not been observed in any other specimen in the collections of the Z.S.I.

On the strength of the investigations conducted by Dr. M. Suter, at the type-locality of *Barbus mussullah* Sykes and having been convinced that Sykes' *Barbus mussullah* is a species of *Tor*, Hora (1943) reassigned *Barbus mussullah* Sykes to *Tor* though it is now established that *Barbus mussullah* is not a *Tor* but belongs to the genus *Hypselobarbus* (Rainboth, 1989). Hora's *Barbus (Tor) mussullah* Sykes is synonymised here with *T. khudree* (Sykes). In captive environment and in reservoirs abnormal deep-bodied forms of *khudree* are sometimes met with. The series of indistinct tubercles on the sides of the head below the eyes in males and the length of head (3.5 in SL) of such abnormal forms of *T. khudree* immediately reveal their identity.

Hora (1943) also a redescrbed *Barbus (Tor) khudree* Sykes based on a female specimen collected by Dr. Rishworth in the

Ulhas river about 40 miles north of Bombay flowing into the Arabian sea from the western slopes of the Ghats. He described the colour as: "silvery bluish grey below the middle line, and almost creamy yellowish white on the ventral surface. The colour is darker above the lateral line, the bases of the scales being grey and their margins reddish grey. The colour of the back is dark olive. The head is dark olive above, and creamy yellowish white below. The fins are bluish grey."

Later Hora (1943a) dealt with the specific identity of Jerdon's species of mahseers from southern India. Excluding those with a serrated dorsal spine, and scales along lateral line numbering more than 30, and with labial folds interrupted, Hora considered five species as mahseers from Jerdon's list of 14 species of *Barbus*. These are *B. hamiltonii*, *B. megalepis*, *B. malabaricus*, *B. mussullah* and *B. khudree*. After a careful study of Jerdon's species Hora concluded that of the five species of *Tor*-type included by Jerdon there are only two types: (1) *Barbus khudree* Sykes (= *B. hamiltonii* nec. Gray and *B. malabaricus* Jerdon) and (2) *B. mussullah* Sykes (= *Barbus megalepis* Jerdon nec. McClelland), distributed widely in the principal rivers of the peninsula.

Shaw and Shebbeare (1929), Shebbeare (1930, 1931), McDonald (1929, 1933), Van Inger (1937) and Parson (1943) recognised several varieties of mahseer based on colouration, which is a highly variable character due to environmental factors (*vide* Hora 1941, p.804).

#### MORPHOMETRIC AND MERISTIC CHARACTERS

The following morphometric and meristic characters of the samples of the different populations occurring in the major river basins of India including Burma were studied.

**Morphometric characters:** 1. Length of head (in Standard length); 2. Depth of body (in Standard length); 3. Length of snout (in length of head); 4. Width of head (in length of head); 5. Depth of head (in length of head);



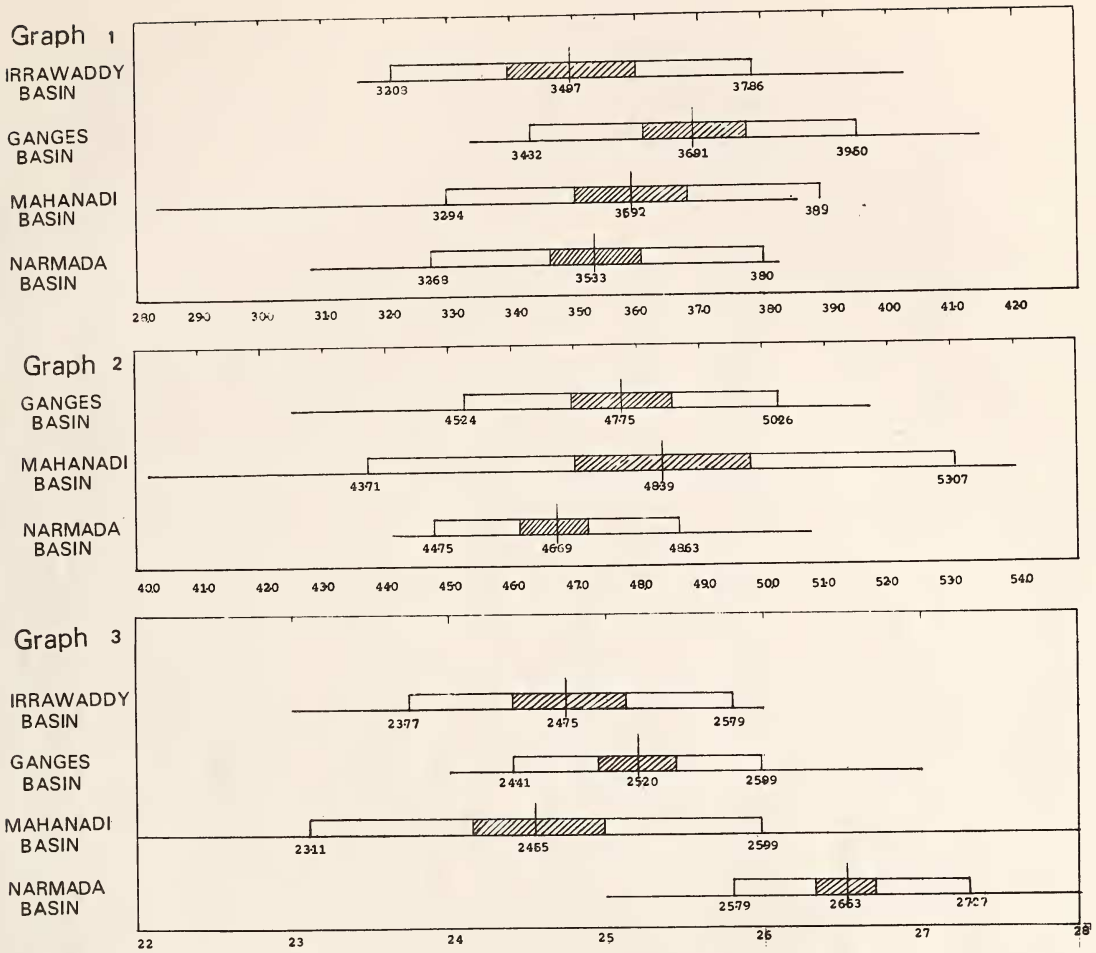


Fig. 2. *Tor tor* (Ham.)

Variation within samples from different drainages; Irrawaddy, Ganges, Mahanadi and Narmada.

Graph 1. Percentage of snout length in head length; Graph 2. Percentage of post-orbital length in head length;

Graph 3. Lateral line scales.

6. Diameter of eye (in length of head); 7. Inter-orbital width (in length of head); 8. Depth of caudal peduncle (in length of caudal peduncle).

**Meristic characters:** 9. Scales along lateral line; 10. Scale rows between lateral line and base of pelvic fin.

**BIOMETRIC COMPARISON OF POPULATIONS**

For a correct taxonomic assessment of the samples, the range, mean, standard deviation

and standard error were calculated for the characters considered important in species differentiation and presented in graph form (Figs. 1-4). For each sample the diagrams show: (1) total range of variation of the particular character indicated by the horizontal line, (2) the mean, by the vertical line indicated in the middle of it, (3) the standard error by the blackened area of each bar and (4) the standard deviation indicated by one half of each black bar plus the white bar at

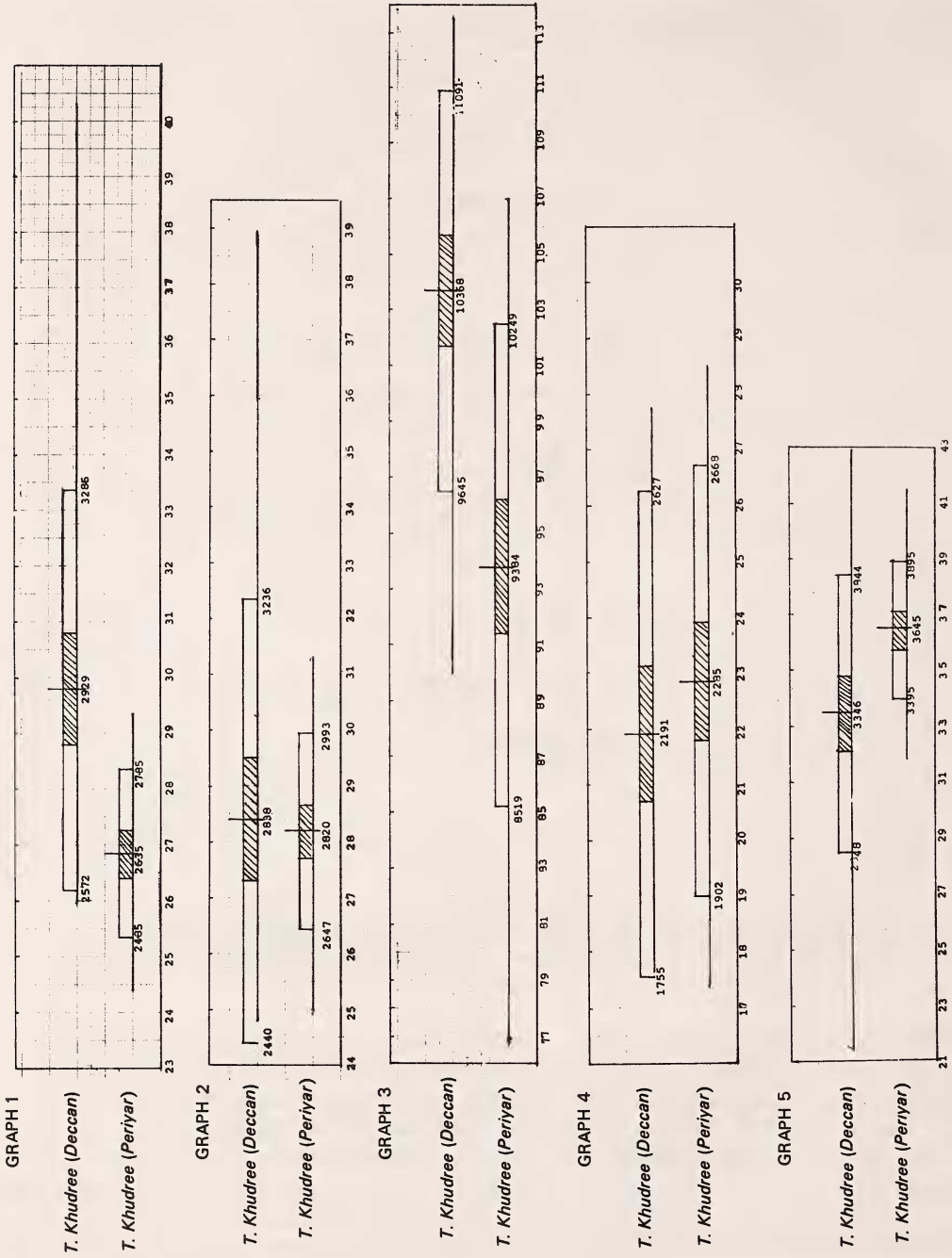


Fig. 3. *T. Khudree* from the Deccan and the Cauvery compared with the population of *T. khudree* from the Periyar river draining Western Ghats into the Arabian sea.

Graph 1. Percentage of head length in SL; Graph 2. Percentage of body depth in SL; Graph 3. Percentage of head length in Body depth; Graph 4. Percentage of eye diameter in head length; Graph 5. Percentage of snout length in head length.

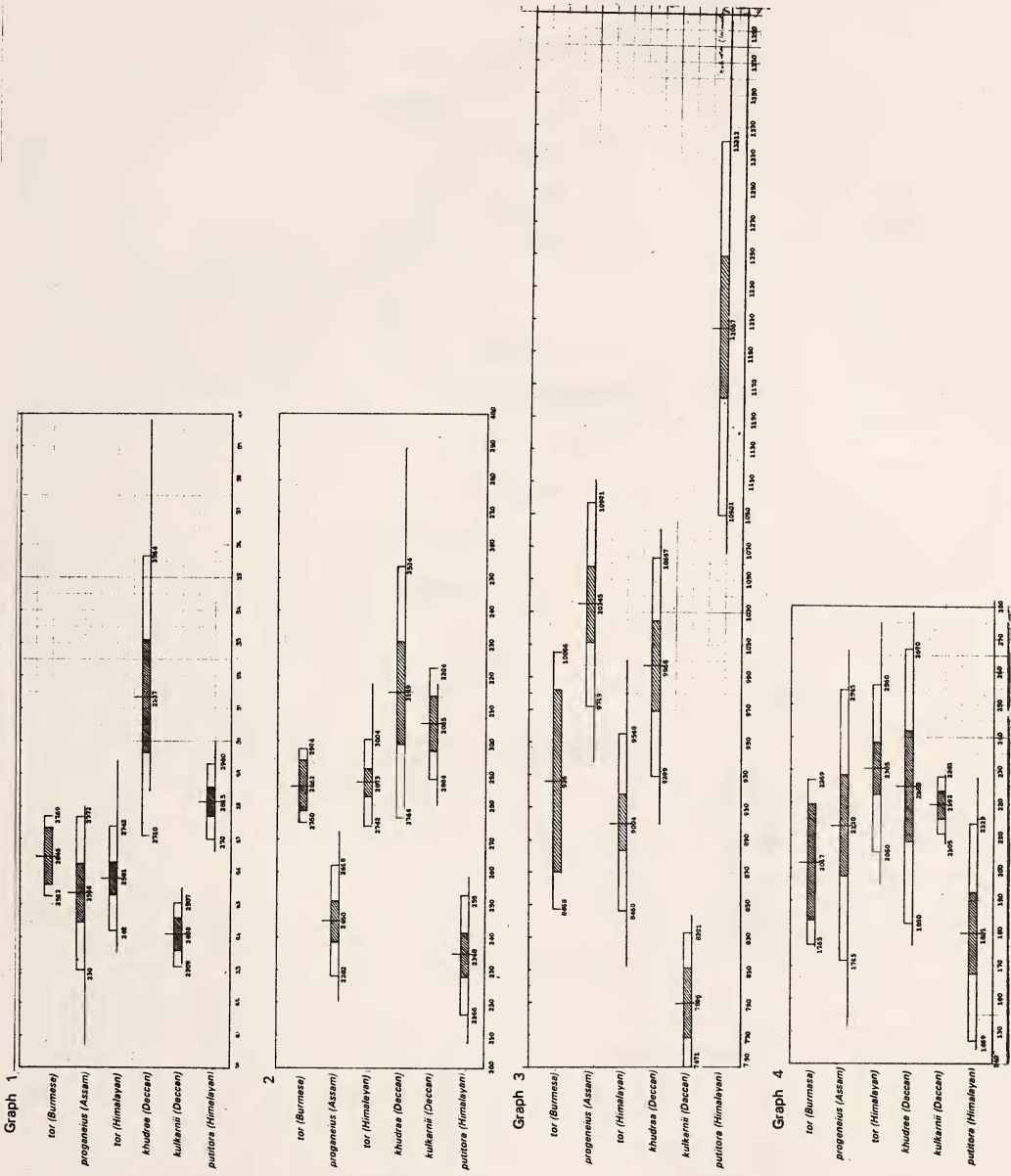


Fig. 4. Variations among different species of *Tor* Gray.  
 Graph 1. Head length in SL, in per cent; Graph 2. Body depth in SL, in per cent; Graph 3. Head length in body depth, in per cent; graph 4. Eye diameter in head length, in per cent.

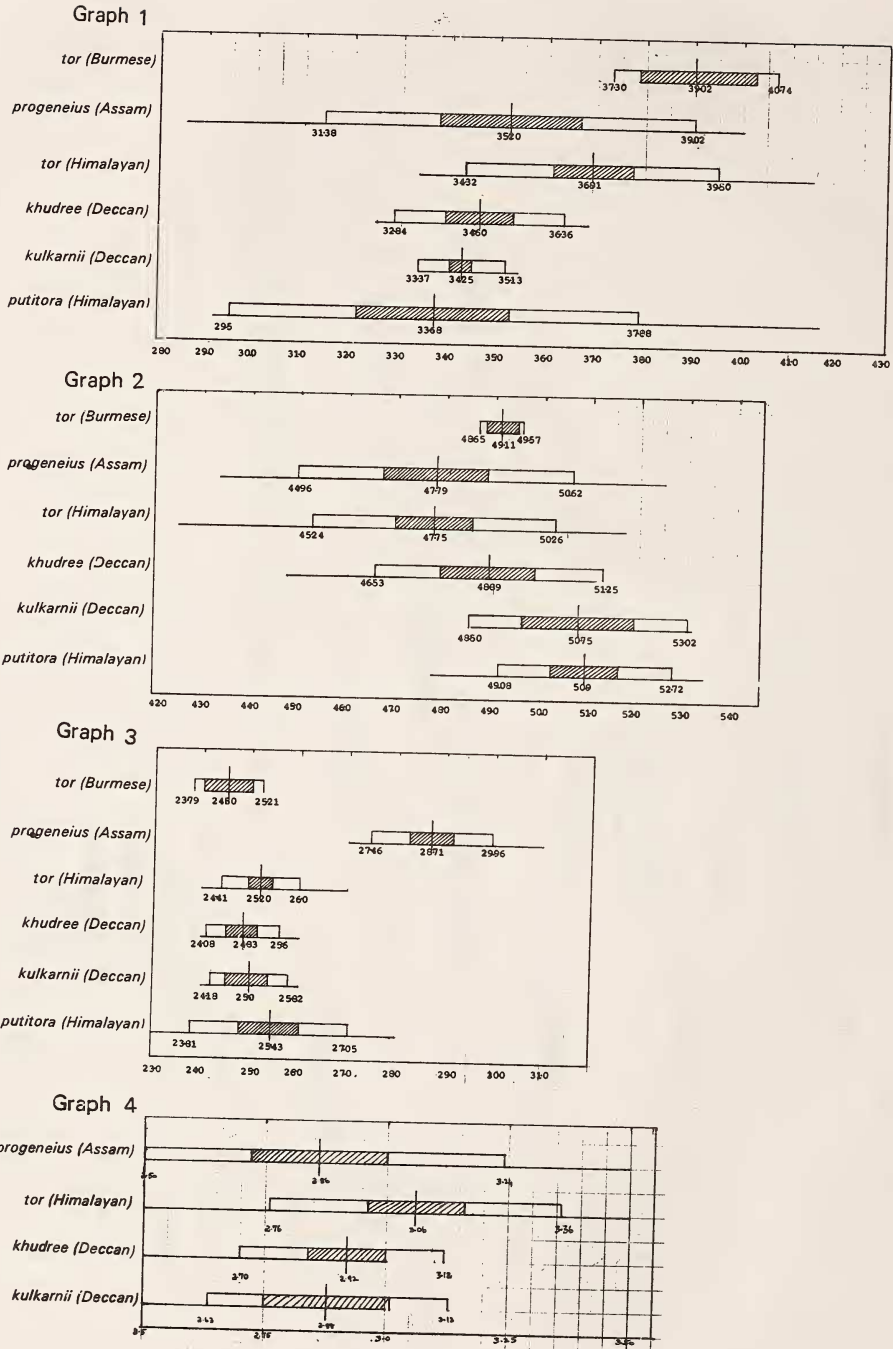


Fig. 5. Variations among different species of *Tor* Gray.

Graph 1. Snout length in head length, in per cent; Graph 2. Post orbital length in head length, in per cent; Graph 3. Lateral line scales; Graph 4. Scale rows between lateral line and base of pelvic.

either end. The degree overlap or divergence of the standard deviations of the characters studied has been taken to determine the status of the populations (vide Hubbs and Hubbs 1953).

The intergradation of characters of *T. tor* populations from the drainages, viz. Irrawaddy, Brahmaputra, Ganges, Mahanadi and Narmada (Fig. 1, Graphs 1-4; Fig. 2, Graphs 1-3) make it evident that these populations are identical and are, therefore, considered as belonging to the same species, *T. tor* (Ham.).

The populations of the Krishna, Godavari, and the Cauvery which are considered as *T. khudree* (Sykes) are pooled together and compared with the populations of the west-flowing rivers of the Western Ghats of Kerala (Fig. 2). It is evident from the overlap of the standard deviation of all the characters tested that they are the same. The Kerala population of *T. khudree* is therefore not considered different from that of the Deccan and the Mysore plateau.

The characters by which the various species of *Tor*, *T. tor*, *T. putitora*, *T. khudree*, *T. progeneius* and the new species, *T. kulkarnii* can be easily separated are represented in Fig. 4, graphs 1-4; Fig. 5, graphs 1-4.

The length of the head in proportion to the depth of the body is considered the most important character in distinguishing the mahseer species occurring in India. This ratio is a measure of the efficiency of the fish to withstand the fast flowing current, the fish becoming more streamlined. Employing this character randomly, however, has often led to difficulty in separating the species. Often in a population of *Tor tor*, specimens somewhat similar to *T. putitora* will be seen. Probably it was because of this overlapping that Day treated *Tor tor*, *T. putitora* and *T. mosal* as a single species. A careful statistical analysis of the populations of the different species has, however, convinced me that the judicious use of the character of head length/body depth ratio is the best method to separate the species. *Tor tor*, *T. putitora*, *T. progeneius*, *T. khudree* and *T.*

*kulkarnii* sp. nov. are the five valid species occurring in India. *T. mosal* is treated in this paper as a junior synonym of *T. tor*.

The length of the head is considerably greater than the depth of body in *T. putitora* (see Fig. 3, graph 3) whereas the length of the head is considerably shorter or more or less equal to the depth of the body in the other species. The length of head is somewhat equal to the depth of body in *T. khudree*, whereas it is shorter in the case of *T. tor* and *T. kulkarnii*. *T. kulkarnii* can, however, be easily separated by its considerably short head (length of head 4.1, 3.8 in *T. tor*, 3.2 in *T. khudree*) (Fig. 4, graph 1). *T. progeneius* has an increased number of scales along the lateral line (Fig. 5, graph 3).

#### GENUS *TOR* GRAY

*Tor* Gray, *Illust. Indian Zool.*, 2:96, 1830-34 (Type species: *Cyprinus tor* Hamilton = *Tor hamiltoni* Gray, haplotype)

*Labeobarbus* Ruppell, *Mus. Senckenberg.*, 2:14, 1936

*Barbus (Tor)* Hora, *J. Bombay nat. Hist. Soc.*, 41(2):276, 1939

*Tor* Smith, *Bull. U.S. Nat. Mus.*, No. 188:137, 1945.

**Diagnostic features:** Medium to large size, body elongate, moderately compressed. Snout more or less prominent, mouth slightly inferior, horseshoe shaped, upper jaw strongly protractile. Lips thick, continuous, lower with an uninterrupted posterior fold, with or without a median lobe on the lower lip. Long maxillary and rostral pairs of barbels.

Dorsal fin with nine branched rays, its origin somewhat anterior to or in line with, the origin of ventrals; last osseous ray elongate, smooth, and non-denticulated. Anal with five branched rays. Scales large, lateral line complete with 24-30 scales. 10-16 (8-10 in *progeneius*) long, slender gill rakers on 1st ceratobranchial. Pharyngeal teeth in three rows, 5.3.2-2.3.5.

**Size:** Specimens of 150 to 247 cm in length and weighing about 60 kg are reported,

45 cm and 2 to 5 kg are more common.

**Distribution:** Asiatic mainland and the Indo-Australian Archipelago.

**KEY TO SPECIES OF THE GENUS *Tor* GRAY**

1. L.I scales less than 27 (24-27) ..... 2  
L.I scales more than 27 (27-30) ..... *T. progeneius* McClell.  
(Brahmaputra drainage, Assam)
2. Length of head considerably greater than depth of body, length of head less than 4 (3.5) times in S.L. .... *T. putitora*  
(Slender bodied Himalayan mahseer, all along the Himalayas)  
- Length of head equal to or considerably shorter than depth of body ..... 3
3. Length of head equal to depth of body (rarely shorter); length of head about 3.5 (3.2) in S.L., sides of head below eye with series of indistinct tubercles in males ..... *T. khudree*  
(Peninsular India, south of Vindhya)  
- Length of head shorter than depth of body. Length of head more than 3.5 in S.L., sides of head smooth without tubercles ..... 4
4. Length of head about 4 (3.8) times in S.L. .... *T. tor*  
(Deep bodied Himalayan mahseer; all along the foot hills of the Himalayas and the Vindhya-Satpuras)  
- Length of head more than 4 (4.17) times in S.L. .... *T. kulkarnii*  
(Godavari drainage, Deccan)

***Tor khudree* (Sykes)**

*Barbus khudree* Sykes, *Proc. Zool. Soc. Lond.*, p.159, 1838 (Mula-Mutha river, 8 miles east of Poona). Sykes, *Trans. Zool. Soc.* 2:357, 1841 (Mula-Mutha river, 8 miles east of Poona). Jerdon, *Madras J. Lit. & Sci.* 15:313, 1849. Bleeker, *Verk. Bat. Gen.*, 25:60, 1853. Hora & Misra, *J. Bombay nat. Hist. Soc.* 40(1):24, 1938 (Deolali). Hora, *J. Bombay nat. Hist. Soc.*, 43(2):167, 1942 (colour, sex differences, weight up to 50 lbs, Mula-Mutha, Poona).

*Barbus hamiltonii* (nec Gray), Jerdon, *Madras J. Lit. & Sci.*, 15:311, 312, 1849.

*Barbus malabaricus* Jerdon, *Madras J. Lit. & Sci.*, 5:312, 1849 (Mountain streams of Malabar). Day, *Fish India* 569, pl. 138, fig. 3, 1878 (South Canara down the Western Ghats to Travancore hills). Day, *Faun. Brit. Ind. Fish.* 1:314, 1889 (South Canara down the Western ghats to Travancore hills).

*Barbus megalepis*, Jerdon (nec McClell.), *Madras Journ. Lit. & Sci.* 15:311, 1849.

*Barbus neilli* Day, *Proc. Zool. Soc. Lond.*, p. 581, 1868

(Thungabhadra river at Kurnool). Beavan, *Handbook FW. Fish Ind.*, p. 45, 1877 (Tambodra R.). Day, *Fish India*, 569, pl. 140, fig. 4, 1878 (Tambodra river, Karnool). Day, *Faun. Brit. Ind. Fish.*, 1:314, 1889 (Karnool on Thungabhadra river).

*Barbus longispinis* Gunther, *Cat. Fish. Brit Mus.*, 7:132, 1868 (Ceylon).

*Barbus (Tor) khudree*, Hora & Misra, *J. Bombay nat. Hist. Soc.* 40:24, 1938 (Mysore). Hora, *Rec. Indian Mus.* 44(2):195, 1942 (Mysore). Hora, *J. Bombay nat. Hist. Soc.* 44(1): 6, 1943 (Ulhas, Cis-Ghat area, north of Bombay).

*Barbus mussullah*, Spence & Prater (nec Sykes), *J. Bombay nat. Hist. Soc.* 36:472, 1932 (upper Krishna, near Satara). Hora, (nec Sykes), *J. Bombay nat. Hist. Soc.* 43(2): 164, 1943 (Systematics, Krishna river).

*Barbus (Tor) mussullah*, Hora (nec Sykes), *J. Bombay nat. Hist. Soc.*, 44(1): 5, 1943 (Description; Cauvery & Bhavani rivers).

*Barbus (Tor) khudree malabaricus*, MacDonald, *J. Bombay nat. Hist. Soc.* 44(3): 52, 1944 (South Canara, W. Ghats, Travancore Hills).

*Tor khudree* Rajan, *J. Bombay nat. Hist. Soc.* 53(1): 45, 1955 (Bhavani R.). Misra, (in part), *Rec. Ind. Mus.*, 57(1-4): 149, 1959 (U.P., Orissa and Peninsular India., Orissa and U.P. excluded). David, *Proc. nat. Acad. Sci.*, 33B(2): 280, 1963 (Krishna & Godavari rivers). Kulkarni, *J. Bombay nat. Hist. Soc.* 75(3): 652, 1979 (Bhima, Krishna, Koyna & Indrayani rivers in Maharashtra). Sen & Jayaram, *Rec. Zool. Surv. Ind., Occ. Pap.* 39: 7, 1982 (Peninsular India, south of R. Tapi). Jayaram (in part), *Rec. Zool. Surv. Ind., Occ. Pap.* 36: 71, 1982 (Cauvery R.).

*Puntius (Tor) khudree*, Kalawar & Kelkar, *J. Bombay nat. Hist. Soc.*, 53: 672, 1955 (Kolhapur).

*Tor khudree malabaricus*, Kulkarni, *J. Bombay nat. Hist. Soc.* 75(3): 652, 1978. Sen & Jayaram, *Rec. Zool. Surv. Ind., occ. Pap.* 39: 13, 1981 (South Canara, Western Ghats, Travancore hills).

*Tor mussullah* (nec Sykes), Misra, *Rec. Indian Mus.*, 57(1-4): 149, 1959. Kulkarni, *J. Bombay nat. Hist. Soc.* 75(3): 652, 1979 (systematic). Jayaram, *Handbook F.W. Fish. India*, p. 124, 1981 (Cauvery, Bhavani and Poona). Jayaram, *Rec. Zool. Surv. Ind. Occ. Pap.* 36: 72, (Cauvery R.)

**Vernacular name:** Khudchee, Barsa (in Pune).

**Common English name:** Deccan mahseer.  
**Diagnostic features:** A streamlined mahseer with the head length almost equal to depth of body; lateral sides of snout with a series of in-

distinct small tubercles in males; back and sides above the lateral line dark in colour, yellowish white below with bluish grey on belly; fins bluish grey.

**Description:** Based on six specimens, 63.0 mm to 175.0 mm S.L. from Krishna river, Satara dist., Maharashtra (4), Day's specimens from Deccan (2).

D. IV, 9., P. 14-16., A. III, 5., C. 19., L.I. 24-26, L. tr.  $4\frac{1}{2}/2\frac{1}{2}-3\frac{1}{2}$

Body elongate, streamlined with the upper profile convex before dorsal fin but slightly concave behind it, lower profile slightly arched. Mouth moderate, sloping downwards posteriorly, its gape does not extend to below eye. Lips fleshy, smooth edged, continuous at the angles of mouth with uninterrupted fold or groove along lower jaw, lower lip with a median lobe of varying length (lips hypertrophied in specimens living in highly torrential habitats). Head sharpish, its length equal to depth of body, it is contained 28.48-39.79 (31.37) per cent of S.L.; its depth 60.0-68.89 (65.26) per cent and its breadth 50.0-62.22 (54.78) per cent of head. Snout pointed; its length contained 32.5-36.84 (34.60) per cent of head; the lateral sides of snout covered with a patch of indistinct small tubercles in males. Nostrils nearer to eye than to tip of snout. Eye dorso-ventral, in the anterior half of head, its size highly variable with size of fish, in smaller specimens it is greater; its diameter 17.65-27.78 (22.50) per cent of head, 52.94-84.62 (65.43) per cent of snout, 50.0-84.62 (67.30) per cent of interorbital width. Two pairs of barbels, maxillary barbels longer than diameter of eye reaching beyond posterior margin of eye, rostral shorter than maxillary, reaching anterior border of eye. Body depth greater than its breadth, 27.97-38.93 (31.49) per cent of S.L.

**Fins:** Dorsal fin almost in the middle of body with its upper margin concave, its last undivided ray modified into a strong, smooth spine, shorter than depth of body below it. Pectoral fin shorter than head; its length 60.0-70.0

(65.11) per cent of head. Pelvics shorter than pectorals, do not extend to base of anal. Anal longer than pelvics, rounded near the tip in female, not reaching the base of caudal. Distance between pectoral and pelvics equal to the distance between pelvic and anal fins. Caudal forked, the lower lobe slightly longer than the upper. Caudal peduncle long and narrow, its least height 64.0-77.27 (71.41) per cent of its own length.

**Scales:** L.I. 24-26;  $2\frac{1}{2}-3\frac{1}{2}$  rows between L.I. and base of pelvic fin,  $4\frac{1}{2}$  rows between L.I. and base of dorsal fin; 9-10 scales before dorsal fin and 10 rows around caudal peduncle.

**Maximum size:** About a metre in length and known to attain a maximum of 22.6 kg. in weight. But fish attaining more than half a metre are not caught these days.

**Colouration:** Colour varies with the habitat in which the fish lives. Usually the sides above lateral line and the back are dark, the sides below lateral line creamy yellowish white and silver bluish grey below on the belly. The bases of scales grey with reddish grey tinged margins. Head dark olive and yellowish white below. Fins bluish grey. Black mahseers are known from Mysore.

**Distribution:** Deccan (Krishna and Godavari drainages) and peninsular India (Cauvery and the west flowing rivers of Kerala, Karnataka and Maharashtra).

**Material examined:** MAHARASHTRA: 3 specimens from Lonavla, SRS/ZSI, Madras. 6 specimens, Krishna river, Satara dist., ZSI, Calcutta. 2 specimens from Deccan (Day's specimens), ZSI, Calcutta. TAMIL NADU: 2 specimens from Beligunda (Cauvery river), SRS/ZSI, Madras. MADHYA PRADESH: 1 specimen, Ponch reservoir (Godavari drainage), SRS/ZSI, Madras. KERALA: 2 specimens, Thannikudy (Periyar river), SRS/ZSI, Madras. 2 specimens, Bhutathankettu Dam, 19 km from Kothamangalam, SRS/ZSI, Madras. 2 specimens, Kallada River near Kuluthupuzha, Quilon dist., SRS/ZSI, Madras.

**Tor kulkarnii** sp. nov.

**Diagnostic features:** Distinguished from other mahseer fishes by its deeper body and with a short head considerably shorter than the depth of the body, 24-26 scales along lateral line and  $2\frac{1}{2}$  rows below it to base of pelvic fin.

**Description:** D. IV, 9, P. 14-16, A. III, 5, C. 19, L.l. 24-26, L.tr.  $3\frac{1}{2}/2\frac{1}{2}$

Body elongate, compressed, compression more towards tail. Upper profile convex before dorsal fin but slightly concave behind it, ventral profile gently arched. Mouth moderate, terminal, sloping downwards posteriorly, its gape not extending to below eye. Lips fleshy, smooth edged, continuous at the angles of mouth with uninterrupted fold or groove along lower jaw. Head sharpish, oval, flattish above; its length considerably shorter than depth of body, it is contained 23.2-25.48 (24.08) per cent of S.L., its depth 71.43-76.04 (74.63) and its breadth 60.0-75.0 (66.69) per cent of head. Snout pointed; its length contained 33.33-35.42 (34.25) per cent of head. Nostrils nearer to eye than to tip of snout. Eye dorso-ventral, in the anterior half of head, its diameter 20.75-22.86 (21.93) per cent of head, 61.11-66.67 (64.05) per cent of snout, 52.5-64.0 (57.88) per cent of interorbital width. Two pairs of barbels, maxillary barbels longer, reaching beyond posterior margin of eye, body depth greater than its breadth, 28.04-31.73 (30.55) per cent of S.L.

**Fins:** Dorsal fin almost in the middle of body with its upper margin concave, its last undivided ray modified into a strong, smooth spine. Pectoral fin shorter than head; its length 68.75-81.13 (74.93) per cent of head. Pelvics not extending to base of anal. Anal longer than pelvics, smaller than pectoral fin, not reaching the base of caudal. Distance between pectorals and pelvics equal to the distance between pelvic and anal fins. Caudal forked, the lower lobe slightly longer than the upper. Caudal peduncle long and narrow, its least depth 60.0-76.47 (69.15) per cent in its own length.

**Scales:** L.l. 24-26 (25);  $2\frac{1}{2}$  rows between L.l. and base of pelvic fin,  $3\frac{1}{2}$  rows between L.l. and base of dorsal fin, 10-11 scales before dorsal fin.

**Maximum size:** 208.0 mm S.L.

**Colouration:** In preserved specimens, body above lateral line is greyish, becoming deeper towards dorsal side, lower parts of head and body silvery. The bases of scales bear dark blotches.

**Holotype:** ZSI No. FF 2710., Darna river, Deolali, Maharashtra state, 208.0 mm S.L., A.G.L. Fraser, 29 April 1936.

**Paratype:** 3 specimens, ZSI No. FF 2711, 148.0 to 200.0 mm S.L., in Zoological Survey of India, Calcutta, taken along with the holotype, bearing the same data as the holotype.

**Relationships:** *T. kulkarnii* is a dwarf cognate of *T. khudree*. The small head and the deeper body distinguish this from all other species of mahseer.

**Tor progeneius** (McClelland)

*Barbus progeneius* McClelland, *Asiat. Res.* 19: 270, 334, pl. 56, fig. 3, 1839 (Assam). Hora, *Rec. Indian Mus.*, 38: 328, figs. 7-9, 1936 (R. Barak, between Nongba and Kalanaga, Naga Hills).

*Barbus (Tor) progeneius*, Hora, *J. Bombay nat. Hist. Soc.*, 42: 526, pl. and tex-figs. 1-3, 1942 (Assam).

*Tor progeneius*, Sen & Jayaram, *Rec. Zool. Surv. Ind. occ. Pap.* 39: 11, 1982 (North-eastern Himalayas in Assam, Naga Hills and Manipur: Manipur excluded).

**Vernacular name:** Jungha in Assamese.

**Diagnostic features:** A graceful streamlined mahseer with the length of head almost equal to depth of body; and scales along lateral line 27 to 31 rows.

**Description:** Based on seven specimens, 100 to 290 mm S.L., from Barak river, Karong (6), Ward Lake, Shillong, Meghalaya (1).

D. IV, 9., P. 14-16, A. III, 5., C. 19., L.l. 27-31, L. tr.  $4\frac{1}{2}/2\frac{1}{2}$

Body elongate, muscular and somewhat compressed towards tail, both profiles gently arched, forming a long fusiform body. Mouth moderate, its gape does not extend to below eye and somewhat obliquely directed upwards. Lips



fleshy, smooth edged, continuous at the angles of mouth with uninterrupted fold or groove along lower jaw; lower lip with a median lobe. Head sharpish in front, its length equal to depth of body, it is contained 20.69-28.0 (25.36) per cent of S.L.; its height 63.33-72.0 (66.78) per cent and its breadth 53.33-66.67 (59.05) per cent of head. Snout pointed; its length contained 28.57-40.0 (35.20) per cent of head, the lateral sides of snout covered with a series of tubercles. Nostrils nearer to eye than to tip of snout. Eye dorso-ventral, in the anterior half of head, its size highly variable with size of fish; in smaller specimens it is greater than in larger specimens; its diameter 15.15-26.67 (21.30) per cent of head, 45.0-69.77 (53.29) per cent of snout, 40.82-80.0 (62.80) per cent of interorbital width. Two pairs of barbels, maxillary barbels longer. Body depth greater than its breadth, 22.07-27.20 (24.50) per cent of S.L.

**Fins:** Dorsal fin almost in the middle of body with its upper margin concave, the dorsal spine weak, the longest ray somewhat equal to depth of body in young specimens but in adult specimens it is shorter. Pectoral fin shorter than head; its length 73.0- 86.0 (78.70) per cent of head. Pelvics shorter, not extending to anal. Anal longer than pelvics, rounded near the tip, not reaching the base of caudal. Distance between pectorals and pelvics equal to the distance between pelvic and anal fins. Caudal deeply forked with both lobes pointed. Caudal peduncle long and narrow, its least depth 41.67-68.18 (56.98) per cent in its own length.

**Scales:** L.l. 27-31,  $2\frac{1}{2}$ - $3\frac{1}{2}$  rows between L.l. and base of pelvic fin,  $4\frac{1}{2}$  rows between L.l. and base of dorsal fin, 10-12 scales before dorsal fin.

**Maximum size:** 690 mm (540 mm S.L.).

**Colouration:** In preserved specimens, body above lateral line is greyish, becoming deeper towards dorsal side, lower parts of head and body silvery. The bases of scales bear dark blotches which are more prominent along dorsal surface.

**Distribution:** Nagaland and Meghalaya (Brahmaputra system).

**Material examined:** INDIA: Nagaland: Barak river (Brahmaputra drainage), ZSI, Calcutta. Meghalaya (Brahmaputra system), ZSI, Calcutta.

The fan-shaped structure behind the upper jaw described by earlier workers is an abnormal formation and none of the specimens examined by me has such a structure.

#### *Tor putitora* (Hamilton)

*Cyprinus putitora* Hamilton, *Fish. Ganges*, pp. 303, 388, 1822 (Type locality Eastern parts of Bengal). Hora, *Mem. Ind. Mus.*, 9(4): 178, 1929.

*Cyprinus mosal* Hamilton, *Fish. Ganges*, pp. 306, 388, 1822 (R. Kosi). Gray, *Ill. Ind. Zool.*, 1, pl. 39, fig. 1 (from Hamilton's MS. drawings) 1830-32.

*Labeobarbus macrolepis* Heckel, *Fish. Caschmir*, p. 60, pl. 10, fig. 2, 1838 (Kashmir).

*Barbus macrocephalus* McClelland, *Asiat. Res.*, 19: 270, 335, pl. 55, fig. 2, 1829 (Rapid rivers of Assam). Valenciennes (in C.V.), *Hist. Nat. Poiss.*, 16: 204, 1842. Gunther, *Cat. Fish. Brit. Mus.*, 7: 131, 1868 (Assam).

*Barbus mosal*, Gunther (in part), *Cat. Fish. Brit. Mus.*, 7: 130, 1868 (Mountain streams of south of Himalayas and Hindukush).

*Barbus tor*, Day (in part), *Fish. India*, p. 564, pl. 136, fig. 5, pl. 140, fig. 1, 1878. Day (in part), *Faun. Brit. Ind. Fish.*, 1:307, fig. 307, 1889.

*Barbus putitora*, Annandale, *Rec. Ind. Mus.*, 16: 136, pl. 3, fig. 15, 1919 (Gauhati, Assam). Hora and Mukerji, *Rec. Ind. Mus.*, 38: 141, 1936 (E. Doon). Hora, *Rec. Ind. Mus.*, 38: 366, 1936. Shaw and Shebbeare, *J. Asiat. Soc. Beng.*, 3: 39, fig. 35, 1937. Hora, *Rec. Ind. Mus.*, 39:44, 1937 (Nepal). De Witt, *Stanford Ichth. Bull.*, 7(4): 73, 1960 (Pokhara, Nepal).

*Barbus (Tor) putitora*, Hora, *J. Bombay nat. Hist. Soc.*, 41(2): 272, 2 pls. and 2 figs., 1939 (systematic position). Menon, *Rec. Ind. Mus.*, 47: 233, 1949 (Kokha nullah, Chhatra, E. Nepal). Menon, *J. Bombay nat. Hist. Soc.*, 48: 539, 1948-49 (Kumaon Himalaya).

*Tor putitora*, Menon, *Rec. Ind. Mus.*, 52: 22, 1954 (Nepal). Misra, *Rec. Ind. Mus.*, 57: 150, 1959. Jayaram, *Handbook F.W. Fish. India*, p. 124, 1981. Shrestha, *Fish. Nepal*, p. 102, 1981. Sen and Jayaram, *Rec. Zool. Surv. India, occ. Pap.* 39: 5, 1982.

*Tor (Tor) putitora*, Mirza & Javed, *Biologia, Special Supplement*, p. 76, 1986 (Bajwat, Head Marala, K. Haro, Sun Sa'esar, Mangla Lake, Tarela Lake and Azad

Kashmir.)

**Vernacular name:** Putitora in Goalpara, Sahara and Turyia in Purnea, Tor in Rangpur, Mahsir in Punjab, Jammu & Kashmir.

**Common English name:** Yellow-fin mahseer.

**Diagnostic features:** An oblong, somewhat compressed, streamlined mahseer, the head broadly pointed anteriorly, the length of the head always considerably greater than the depth of body. Back reddish sap-green in colour, generally with a broad purplish band above the lateral line, below the lateral line the body is orange fading into silvery white on the belly, paired fins yellowish.

**Description:** Based on 7 specimens, 116.0 to 320.0 mm from Namdapha river, Tirap dist., Arunachal Pradesh (1), Day's figured specimen (1), Day's specimen from Assam (1), Nainital (1), Jhelum river, Kashmir (1), Tawi river, Jammu (1), and Salt Range (1).

D. IV, 9-10; P. 14-17; V. 9; A. III, 5; C. 19; L.l. 23-28; L. tr.  $4\frac{1}{2}$  /  $2\frac{1}{2}$ .

Body muscular, elongate and somewhat compressed, both profiles gently arched forming a long fusiform body. Mouth small, sub-terminal; its gape does not extend to below eye. Lips fleshy, sometimes greatly thickened, smooth edged, continuous at angles of mouth with uninterrupted fold or groove along lower jaw. Lower lip with a median lobe of varying length; in specimens from fast-flowing highly rocky streams it is longer and sometimes co-extensive with extent of mouth, smaller with ordinary lips (not hypertropied) in specimens living in slow moving sandy and pebbly habitats. Head long, broadly pointed anteriorly; its length always greater than depth of body; it is contained 26.67-30.0 (28.15) per cent of S.L., its depth 55.41-63.64 (59.83) per cent, its breadth 43.92-55.56 (49.47) per cent of head, length of snout 29.17-41.67 (33.68) per cent of head. Interorbital width almost equal to or slightly less than snout length, its width 24.32-31.82 (28.01) per cent of head. Eye large, dorso-lateral in position, its diameter 14.44-22.73 (18.01) per cent of

head, 36.0-75.0 (54.87) per cent of snout and 50.0-83.33 (64.53) per cent of interorbital width (in smaller specimens eye is larger and more than interorbital width but in smaller specimens it is less). Two pairs of barbels, maxillary barbels longer than diameter of eye, reaching beyond posterior margin of eye, rostral equal to or sometimes shorter. Body depth greater than its breadth 20.78- 25.86 (23.48) per cent of S.L.

**Fins:** Dorsal fin almost in middle of body with upper margin concave, its last undivided ray forming a strong smooth spine, shorter than depth of body below it, but in some it is equal to body height. Pectoral fin sharp with slight convex edge, considerably shorter than head, its length 58.89-72.22 (65.61) per cent of head. Pelvic horizontal, almost midway between head and caudal base, its origin slightly behind and just under dorsal origin, not reaching anal opening. Distance between pectoral and pelvics almost equal to distance between pelvics and anal fin base. Anal fin equal to or slightly shorter than pectorals, not reaching base of caudal fin. Caudal fin forked with the lower lobe somewhat more pointed. Caudal peduncle long and narrow, its least depth 50.0-71.43 (59.08) per cent of its own length.

**Scales:** L.l. 23-28;  $2\frac{1}{2}$  rows between L.l. and base of pelvic fin,  $4\frac{1}{2}$  rows between L.l. and base of dorsal fin, 9-11 scales before dorsal fin and 11-12 rows around caudal peduncle.

**Maximum size:** 2.7 metres. Hora (op. cit.) recorded specimens of 60 cm (2 feet). According to Thomas (op. cit.) 18 to 25 kg fish were common in India but these days fish more than 5 kg are rarely caught.

**Colouration:** Hamilton (loc. cit, p. 6) noted the colour as dusky above with a gloss of steel, while the edges of scales changed from gold to silver. Fins tinged yellowish. According to Hora (1939) the colour varies according to the nature of water inhabited by the fish. The back is reddish sap-green. Below the lateral line, the body is light orange fading to silvery white on belly. In specimens about 30 cm the dorsal fin is

light yellowish with the rays conspicuously yellowish grey, pectorals pinkish at base with citron yellow distally; pelvic, anal and caudal fins yellowish with pink extremities. In larger specimens the pelvic, pectoral and caudal fins are peacock green. In specimens collected from torrential rivers the paired fins are generally pale in colour.

**Distribution:** INDIA: All along the base of the Himalayas including Kashmir; Pakistan, Bangladesh.

**Material examined:** INDIA: Arunachal Pradesh: 1 specimen, ZSI, Calcutta; Assam: 2 specimens, ZSI, Calcutta; U.P.: 1 specimen, ZSI, Calcutta; Jammu & Kashmir: 2 specimens, ZSI, Calcutta; Punjab: 1 specimen, ZSI, Calcutta.

#### Tor tor (Ham.)

*Cyprinus tor* Hamilton, *Fish. Ganges*, pp. 305, 388, 1822 (R. Mahananda). Gray, *Ill. Ind. Zool.*, 2, pl. 93, fig. 1 (from Hamilton's MS. drawings, 1834).

*Barbus megalepis* McClelland, *Asiat. Res.*, 19, pp. 271, 337, 1839 (Northern parts of Bengal).

*Tor hamiltonii* Gray, *Ill. Ind. Zool.*, 2, pl. 36, fig. 1, 1839.

*Barbus hexasticus* McClelland, *Asiat. Res.*, 19, pp. 269, 333, pl. 39, fig. 2, 1839 (Great rivers in the plains of India). Day (in part) *Fish. India*, p. 565, pl. 136, fig. 4, 1878 (Kashmir, Sikkim and Assam). Day (in part) *Faun. Brit. Ind. Fish.*, 1:308, 1889. Hora, *Rec. Indian Mus.*, 22:174, 1921 (Manipur). Prasad & Mukerji, *Rec. Indian Mus.*, 31:200, text-fig. 7, 1929 (Indawgyi Lake, Upper Burma).

*Barbus mosal*, Valenciennes (in C. V.), *Hist. Nat. Poiss.*, 16:200, 1842. Bleeker, *Verh. Bat. Gen.*, 25:60, 1853. Day, *Proc. Zool. Soc. Lond.*, p. 372, 1870. Gunther (in part), *Cat. Fish. Brit. Mus.*, 7:130, 1868 (Mountain streams of south of Himalayas and Hindukush).

*Barbus tor*, Day (in part), *Fish. India*, p. 364, 1878. Day (in part) *Faun. Brit. Ind. Fish.*, 1:307, 1889. Hora & Mukerji, *Rec. Indian Mus.*, 37:383, 1935 (Naga Hills). Hora & Mukerji, *Rec. Indian Mus.*, 38:134, 139, fig. 1, 1936 (R. Barak, between Nongba and Kalanaga, Naga Hills). Mukerji, *J. Bombay nat. Hist. Soc.* 37:63, 1984 (Burma).

*Tor khudree*, Chauhan (nec Sykes), *Rec. Ind. Mus.*, 15:270, 1918 (R. Tel, tributary of the Mahanadi, Orissa). Hora, *J. Zool. Soc. India*, 1, No. 6: 1949 (R. Rihand, U.P.). Motwani & David, *J. Zool. Soc. India*, 9, No.

1:11, 1957 (R. Sona, M.P.)

*Barbus (Tor) mosal*, Hora, *J. Bombay nat. Hist. Soc.* 41:784, pls. 1 and 2, figs. 1-5, 1941 (Assam).

*Barbus (Tor) tor*, Hora, *J. Bombay nat. Hist. Soc.*, 41:518, 1941 (systematic position).

*Tor tor mosal*, Macdonald (nec Ham.), *J. Bombay nat. Hist. Soc.*, 44:189, 1943 (Burma).

*Tor mosal mahanadicus* David, *J. Zool. Soc. India*, 5, No. 2:246, 1953 (Hirakund stretch, Mahanadi, Orissa).

*Tor tor*, Menon, *Rec. Indian Mus.*, 52:22, 1954 (Manipur). Motwani & David, *J. Zool. Soc. India*, 9, No. 1:11, 1957 (R. Sona, M.P.). Misra, *Rec. Indian Mus.*, 57:150, 1959. Srivastava, *Fish. Eastern U.P.*, 57, 1968 (Gorakhpur). Jayaram, *Handbook F.W. Fish. India*, p. 124, 1981. Shrestha, *Fish. Nepal*, p. 104, 1981. Sen & Jayaram, *Rec. Zool. Surv. Ind., Occ. Pap.*, 39:9, 1982.

**Vernacular name:** Tor mahseer.

**Common English name:** Red-fin mahseer.

**Diagnostic features:** A more stoutly built mahseer than the putitor, with the ventral profile more prominently arched than the dorsal. Head sharpish anteriorly and is invariably shorter than the depth of the body. Dorsal surface greyish-green, the sides of the body in the middle pinkish replaced with greenish fold above and olive green below. Fins deep orange.

**Description:** Based on 10 specimens 68.0 to 162.0 mm S.L. from Suswa and Song rivers, Dehra Dun, U.P.

D. IV, 9., p. 14-16., A. III, 5., C 19., L. I. 22-28, L. tr.  $3\frac{1}{2}$ - $4\frac{1}{2}$  /  $2\frac{1}{2}$ - $3\frac{1}{2}$

Body more stoutly built than the Putitor mahseer, muscular and compressed, with ventral profile more prominently arched than the dorsal, dorsal profile convex before dorsal fin but slightly concave behind it. Mouth small, its gape does not extend to below eye. Lips fleshy, smooth edged, continuous at the angles of mouth with uninterrupted fold or groove along lower jaw, lower lip invariably with a median lobe of varying length. In the Dehra Dun examples, the lips and the median lobe are moderately developed. (Lips hypertrophied in specimens living in torrential streams of Tista river, Darjeeling and Barak river, Assam). Head sharpish anteriorly, and shorter than the depth of body (or equal in young examples), it is con-

tained 23.53–29.41(25.81) per cent of S. L.; its depth 69.23–77.59(73.12) per cent, its breadth 50.0–62.50(57.80) per cent of head. Snout pointed; its length contained 33.33–41.46(36.91) per cent of head. Nostrils nearer to eye than to tip of snout. Eye dorso-ventral, in the anterior half of head, its size highly variable with size of fish, in smaller specimens it is greater than in larger specimens; its diameter 19.51–27.50 (23.05) per cent of head, 47.06–78.57(62.97) per cent of snout, 53.33–91.67(69.47) per cent of interorbital width. Two pairs of well-developed barbels, maxillary barbels slightly longer than the rostral but shorter than diameter of eye. Body depth greater than its breadth 22.46–31.75(28.73) per cent of S.L.

**Fins:** Dorsal fin almost in the middle of body with its upper margin concave, its last undivided ray strong and bony and is invariably shorter than the depth of body. Pectoral fin slightly shorter than head; its length 62.50–86.21 (73.49) per cent of head. Pelvic fins do not extend to anal opening. Anal longer than pelvics, not reaching the base of caudal. Distance between pectorals and pelvics equal to the distance between pelvic and anal fins. Caudal deeply forked, the lower lobe sharply pointed. Caudal peduncle long and narrow, its least depth 59.38–78.26 (67.82) per cent of its own.

**Scales:** L.1. 22–28,  $2\frac{1}{2}$  to  $3\frac{1}{2}$  rows between L.1. and base of pelvic fin,  $3\frac{1}{2}$  to  $4\frac{1}{2}$  rows between L.1. and base of dorsal fin, 11–12 scales before dorsal fin and 11–12 rows around caudal peduncle.

**Maximum size:** 1.7 metres, weighing 45 kg (Thomas 1897).

**Colouration:** Hamilton (1822, p. 305) noted the colour as gold and green above, silvery below and the fins of the belly reddish. According to Hora (1940), the dorsal surface is greyish-green, that of head neutral green. The sides of the body in the middle are pinkish, replaced above by greenish gold and below by olive green. The dorsal fin is reddish buff, the

pectorals, pelvics and anal fins are deep orange.

**Distribution:** INDIA: Assam and all along the foothills of the eastern and central Himalayas as far as Jumna system, higher reaches of the Mahanadi in Orissa and the Vindhyas and Satpura ranges, Madhya Pradesh; Bangladesh, Burma.

**Material examined:** INDIA: Assam: 6 specimens, ZSI, Calcutta, Barak river, Karong. Meghalaya: Shillong, 1 specimen, 290.0 mm S.L., ZSI, Calcutta. Uttar Pradesh: Dehra Dun: 10 specimens, ZSI, Calcutta, Suswa and Song drainages. Orissa: 11 specimens, ZSI, Calcutta. Sundargarh: Brahman river. Madhya Pradesh: Narmada drainage, 14 specimens SRS/ZSI, Madras. BURMA: Kamaing, Myitkyiana Dist., ZSI, Calcutta, 2 specimens.

#### SUMMARY

The literature relating to systematics of various species of *Tor* is reviewed and it is pointed out that neither melanism and other variations in colour nor the enlargement of the lips usually met with among species of mahseer should be mistaken for specific or racial features. Morphometric data of samples of deep-bodied Himalayan mahseer *Tor tor* (Ham.) from various drainages is biometrically analysed and the results indicate that they belong to the same species. *T. mosal* (Ham.) is synonymised with *T. putitora* (Ham.); *Tor mosal* of Hora (nec. Ham.) is synonymised with *T. tor* (Ham.). The deep-bodied mahseer from the peninsula so far confused with *Hypselobarbus mussullah* Sykes is reidentified as an abnormal *T. khudree* (Sykes). A series of tubercles on the sides of the head below the eyes in the males of *khudree* is characteristic of the species, though presence of tubercles in the breeding males is reported in *putitora* mahseers as well; *progeneius* is the only species having a series of tubercles on the lateral sides of snout in both the sexes.

Description of a new mahseer characterised by a short head discovered from the Dharna river (Godavari drainage) at Deolali is also given.

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